

registered vehicles as the Jeep, but they had very similar SSFs. They also had very similar rollover rates in terms of rollovers per single-vehicle crash that were consistent with their SSFs. IIHS expects a good dynamic rating to show a large difference between the Grand Cherokee and the 4Runner. That will not be possible because differences in dynamic maneuver test performance predict only small differences in rollover rate, and, in fact, there is not a large difference in rollover rate between these vehicles in terms of rollovers per single-vehicle crash in our six state crash data base. The difference is in the definition of rollover rate. A rollover rate in terms of fatal rollovers per 100,000 vehicles depends on the rate of single-vehicle crashes per 100,000 vehicles and on the occurrence of a fatality in the rollover as well as on the rate of rollover per single-vehicle crash. The first two of these factors depend primarily on demographic and environmental influences and can mask actual differences or similarities between vehicles as in this case. Neither vehicle had yaw stability control, which would have created a plausible vehicle-related difference in single-vehicle crash rate. The difference in fatality rate could involve crashworthiness features, or particularly in the case of rollover, it could merely reflect the seat belt wearing habits of a risk taking demographic that also experienced a higher rate of single-vehicle crashes. The rate of rollovers per single-vehicle crash is much less sensitive to demographic influences than is the rate of fatal rollovers per 100,000 vehicles.

Carr Engineering and Suzuki commented that the agency was not following the recommendations of the NAS study by performing J-Turn and Fishhook maneuver tests. They believe that the NAS recommended handling tests to assess loss of control potential rather than limit maneuvers to assess the resistance of the vehicle to actual on-road tip-up. We agree that the language of the NAS study report is somewhat ambiguous. That is why we included in our NPRM notice the clarification the NAS study panel gave us during the presentation of the report to NHTSA in response to our direct questions about J-Turn and Fishhook tests versus handling tests. The NAS study committee clarified that it envisioned dynamic maneuver tests as limit maneuvers where loss of control and actual on-road vehicle tip-up can be expected for vulnerable vehicles. The NAS study panel stated it was not in a position to recommend a specific test because that would require study of

discriminatory capability, repeatability and other properties, but J-Turns and Fishhooks were of the type of tests it had in mind. Two outside experts in vehicle dynamics and testing reviewed our test plan before the Phase VI test of the 25 vehicles. One had been a member of the NAS study committee. Once again, we were assured that our tests were consistent with the NAS recommendations.

We believe that both our test selection and our analysis method of developing a rollover risk model to combine SSF and dynamic test results are entirely consistent with the recommendations of the NAS study and therefore appropriate to satisfy the requirements of the TREAD Act. We agree that it is important to inform consumers of the effectiveness of yaw stability control in reducing single-vehicle crashes, and we will determine its effectiveness from crash report data as sufficient data becomes available.

C. The J-Turn and Fishhook Maneuvers

There were a number of comments regarding the J-Turn and Fishhook test protocols from the Alliance, GM, Toyota, Honda, Nissan, Renfroe Engineering, Carr Engineering, Mechanical Systems Analysis Inc, and Automotive Testing Inc. In addition, Ford made a detailed presentation elaborating on some of the subjects introduced in the Alliance comment. The Ford presentation material was placed in Docket NHTSA-2001-9663.

A number of the commenters objected to the J-Turn maneuver because they thought it was not representative of real driving, involved too fast a steering movement, or was redundant. Since its results were not used in the risk model, we agree that it is redundant. As a result, we are no longer planning to use it in the NCAP testing program.

Except for Suzuki, Carr Engineering and Ford, those who commented on the maneuver tests supported the Fishhook maneuver. Carr Engineering and Advocates objected to calling the Fishhook maneuver a road edge recovery test as we had done in the NPRM notice. While the Fishhook maneuver includes steering commands like a crash involving road edge recovery, it is performed on a smooth uniform surface instead of one with vertical drop-offs and friction coefficients differences that exist at road edges. To accommodate these concerns, we will refer to the maneuver as the Fishhook.

D. Tire Wear

The effect of tire wear on test results and the tire changing protocol was

addressed by several commenters. Tire shoulder wear during limit maneuver tests is much more severe than in ordinary driving and has the effect of increasing the lateral acceleration capability of the vehicle. After a number of tests, the tire wear causes the vehicle to tip up more easily, and there is concern that a vehicle with test-worn tires does not represent a typical street driven vehicle. In the 25 vehicle tests, new tires were used for each maneuver (FH, FL, JH, JL) which limited the tires to no more than 6 runs in each direction (4 for Fishhooks) before detecting tip-up if it occurred.

Ford gave an example using a Ford Ranger 4WD that was apparently known to tip up at 53 mph with worn tires in a J-Turn test. The vehicle was equipped with new tires and tested repeatedly at 53 mph. It did not tip up during the first three runs, but during the fourth run a large increase in lateral acceleration and sideslip angle occurred and the vehicle tipped up. It continued this behavior for two subsequent runs, and the tires exhibited a large amount of shoulder wear after only six runs. We have noticed similar tire wear effects, but not in so few runs. The J-Turn tests are of much longer duration than Fishhook tests and produce more wear per run. Also tests run at lower speeds approaching tip-up speed produce less wear than tests performed at a higher speed just below the tip-up speed. Ford's example of a worst case in which the tire wear of just three runs changed vehicle behavior from no tip to tip-up is an effective illustration of the tire wear problem.

We believe this problem is much less acute for Fishhook tests. We performed a similar experiment using a 2001 Ford Explorer 4 door 4WD that we knew would tip up at 40 mph on worn tires in a Fishhook maneuver. We performed 18 test runs without tip-up and then experienced a 20 degree tip-up against the outriggers on the nineteenth run. We performed three more runs and experienced two more tip-ups. Renfroe Engineering also commented about tire wear effects citing an UMTRI study in which lateral tire forces remained steady for about 10 runs and then increased to a maximum force at about 20 runs.

Ford suggested a tire change protocol to limit tire wear. We intend to test a number of vehicles in the summer of 2003. During these tests we will use the tire change protocol of Appendix I because we believe this appropriately limits the effect of tire wear. However, we intend to confirm tip-ups using new (broken in but not worn) tires when appropriate to make sure that the